Screwworm Myiasis

Importance
Screwworms are fly larvae (maggots) that feed on living flesh. These parasites can infect any mammal or bird and can enter wounds as small as a tick bite. Left untreated, screwworm infestation can be fatal. Screwworms have been eradicated in the United States, Mexico, and all countries in Central America; however, they could become re-established from larvae carried on infested animals.

Etiology
New World screwworm myiasis is caused by the larvae of *Cochliomyia hominivorax* (Coquerel). Old World screwworm myiasis is caused by the larvae of *Chrysomya bezziana* (Villeneuve). These fly larvae are obligate parasites of live animals and feed on the living tissues and fluids inside wounds.

Species affected
All warm-blooded animals can be infested by screwworms; however, these parasites are much more common in mammals than in birds.

Geographic distribution
Screwworms are very susceptible to freezing temperatures and to long periods of near-freezing temperatures. These organisms are seasonal in some areas, and can spread into colder climates during the summer.

New World screwworms are found only in the western hemisphere, primarily in the tropical and semitropical regions of South America, but are rare above 7,000 feet. These parasites were once widespread, but eradication programs (through the release of sterile male flies) have eliminated them from the United States, Mexico, Puerto Rico, the Virgin Islands, Curacao, and all of Central America and most of Panama, leaving only a small zone at the border with Colombia. The New World screwworm still exists in some countries of South America and on some Caribbean islands. Eradication programs are ongoing in Jamaica. In 1988, New World screwworms were detected in Libya, but have since been eradicated.

C. bezziana, the Old World screwworm, can be found in Southeast Asia, Kuwait, the Indian subcontinent, the main island of Papua New Guinea, tropical and sub-Saharan Africa, Oman, Muscat, and Fujaira. This fly has never become established in Europe, North Africa, Australia, the Middle East, or the Western Hemisphere.

Transmission
Screwworm infestations are transmitted when a female fly lays her eggs on a superficial wound. Occasionally, Old World screwworms also lay their eggs on unbroken soft skin, particularly if it has blood or mucous discharges on its surface. The larvae hatch and burrow into the wound or into the flesh. Wounds infested by screwworms often attract other female screwworms, and multiple infestations are common. After feeding for 5 to 7

days, the screwworm larvae leave the wound and fall to the ground, then burrow into the soil to pupate. The adults that emerge feed on wound fluids and mate after 3-5 days. The lifespan of a male fly is approximately 14 days; 30 days is common for a female.

Female screwworms are attracted to all warm-blooded animals. The distance a fly will travel can range from 10-20 km in tropical environments with a high density of animals to as far as 300 km in arid environments. Outbreaks in non-endemic areas often occur when animals with screwworm myiasis are introduced or when adult flies are carried in vehicles.

Incubation period

Screwworm larvae emerge from the eggs in 8 to 12 hours. They mature in 5 to 7 days and leave the wound to pupate.

Clinical signs

Screwworms can infest a wide variety of wounds, from tick bites to cuts, dehorning or branding wounds, and other injuries. Infestations are very common in the navels of newborns.

In the first day or two, screwworm infestations are difficult to detect. Often, all that can be seen is slight motion inside the wound. As the larvae feed, the wound gradually enlarges and deepens. Infested wounds often have a serosanguineous discharge and sometimes a distinctive odor. By the third day, the larvae may be easily found; as many as 200 vertically oriented parasites can be packed deep inside the wound. However, screwworm larvae do not generally crawl on the surface, and tend to burrow deeper when disturbed. Sometimes, there may be large pockets of larvae with only small openings in the skin. Screwworms may be particularly difficult to find inside the nasal, anal, and vaginal openings. In dogs, the larvae often tunnel under the skin. Larvae from other species of flies, which feed on dead and decaying tissues, may also infest the wound.

Infested animals usually separate from the herd and lie down in shady areas. Discomfort, decreased appetite, and lower milk production are common. Untreated animals may die in 7 to 14 days from toxicity or secondary infections.

Post mortem lesions

Screwworms may be found post-mortem in any wound.

Morbidity and Mortality

The morbidity from screwworms varies, but can be very high when the ecological conditions are favorable. In some areas, screwworms may infest the navel of nearly every newborn animal.

A single deposition of eggs, or a treated infestation, is not usually fatal; however, deaths may occur in smaller animals or from secondary infections. Untreated wounds usually develop multiple infestations and are often fatal within 7 to 10 days. Deaths seem to be more common with the New World screwworm than with the Old World screwworm.

Screwworm infestations can be successfully treated with topical larvacides or some drugs. No vaccine is available.

Diagnosis

Clinical

Screwworm myiasis should be suspected in animals with draining or enlarging wounds with symptoms of infestation. New World screwworm eggs are creamy and white, and are deposited in a shingle-like array on or near the edges of superficial wounds. The egg masses of Old World screwworms are similar but larger. The eggs from other species of flies are usually not well organized.

The second and third instar larvae of screwworms resemble a wood screw. They are cylindrical, with one pointed end and one blunt end, and have complete rings of dark brown spines around the body. In third stage larvae, dark tracheal tubes can be found on the dorsum of the posterior end. Field diagnosis, even with a microscope or magnifying glass, is difficult.

Female screwworm flies are larger than a housefly. The thorax of a New World screwworm is dark blue to blue-green and the head is reddish-orange. On the back of the thorax, there are three longitudinal dark stripes; the center stripe is incomplete. The Old World screwworm is green to bluish-black, with two transverse stripes on the thorax. Adult screwworms are difficult to distinguish from other flies.

Differential Diagnosis

The differential diagnosis includes all other blowfly larvae that may infest wounds.

Laboratory Tests

Laboratory diagnosis is by identification of the parasites under the microscope. Serology is not used.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, contact the AVIC. These samples should only be sent under secure conditions, by authorized personnel, and to authorized laboratories to prevent the spread of disease. Screwworms can infest humans; samples should be collected and handled with all appropriate precautions.

Larvae should be removed from the wound with tweezers before the wound is treated. The larvae should be collected from the deepest parts of the wound. Any eggs on the edge of the wound should be carefully removed with a scalpel. The samples of eggs, larvae, or flies should be placed in 80% alcohol and transported to the laboratory. Formalin should not be used.

Recommended actions if screwworm is suspected

Notification of authorities

Screwworm infestations should be reported to state or federal authorities immediately upon diagnosis or suspicion of the disease. Federal: Area Veterinarians in Charge (AVICS) http://www.aphis.usda.gov/vs/area_offices.htm
State vets: http://www.aphis.usda.gov/vs/sregs/official.html

Quarantine and Disinfection

Organophosphate insecticides are effective against newly hatched larvae, immature forms, and adult flies. Larvae inside wounds must be treated with a suitable larvacide. Spraying or dipping animals with an approved insecticide and treating infested wounds can protect against new infestations for 7 to 10 days. Larvae that are removed from the wound must be placed in alcohol preservative or destroyed. If any larvae leave an infested wound and mature into adults, screwworm can become established in an area.

Public health

Humans can be hosts for screwworm larvae.

For More Information

World Organization for Animal Health (OIE)
http://www.oie.int

OIE Manual of Standards
http://www.oie.int/eng/normes/mmanual/a_summry.htm

OIE International Animal Health Code
http://www.oie.int/eng/normes/mcode/A_summry.htm

USAHA Foreign Animal Diseases book
http://www.vet.uga.edu/vpp/gray_book/FAD/

References

"New World Screwworm (*Cochliomyia hominivorax*) and Old World Screwworm (*Chrysomya bezziana*)." In *Manual of Standards for Diagnostic Tests and Vaccines.* Paris: World Organization for Animal Health, 2000, pp. 313-321.

"Obligatory Myiasis-Producing Flies." In *The Merck Veterinary Manual*, 8th ed. Edited by S.E. Aiello and A. Mays. Whitehouse Station, NJ: Merck and Co., 1998, pp. 652-4.

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